CLAIMS

I claim:

1. A mass flow controller, comprising:

a flow input port located on a lower end of the controller;

a flow output port located on the lower end of the controller;

a sensor unit in fluid connection with the input port and the output port;

a first channel for carrying a first amount of fluid from the input port to the output port;

a second channel for carrying a second amount of fluid through the sensor unit, wherein the second amount is less than the first amount;

an orifice assembly coupled to the output port, wherein the orifice assembly has at least one orifice opening; and

a magnetic field generator coupled between the orifice assembly and the sensor, wherein the magnetic field generator, in response to the sensor unit, generates a magnetic flux in a direction from the sensor unit to the orifice assembly to allow flow through the at least one orifice opening.

2. The mass flow controller of Claim 1, wherein the flow direction through the sensor unit is approximately perpendicular to the flow direction of the magnetic flux.

3. The mass flow controller of Claim 1, further comprising a bypass assembly coupled between the sensor

unit and the orifice assembly, wherein the bypass assembly comprises grooves to allow fluid to flow through.

4. The mass flow controller of Claim 3, further comprising a spring-biased sealing mechanism coupled between the bypass assembly and the orifice assembly and moveable along the flow direction.

5. The mass flow controller of Claim 4, wherein the orifice assembly comprises an orifice plate, and wherein the sealing mechanism is located between the bypass assembly and the orifice plate.

6. The mass flow controller of Claim 4, wherein the sealing mechanism has openings to allow flow to the orifice plate.

7. The mass flow controller of Claim 1, wherein the at least one orifice opening is a central hole.

8. The mass flow controller of Claim 4, wherein the spring-biased sealing mechanism seals the at least one orifice opening when no magnetic flux is generated.

9. The mass flow controller of Claim 1, wherein the magnetic field generator comprises:

a solenoid core; and

a solenoid coil surrounding the solenoid core, wherein the solenoid core comprises a ferromagnetic material.

10. The mass flow controller of Claim 3, wherein the magnetic flux travels through the bypass assembly.

11. A mass flow controller, comprising:

an input port;

a first input channel in fluid connection with the input port;

a second input channel in fluid connection with the first input channel, wherein the second input channel is smaller than the first input channel;

a sensor unit in fluid connection with the second input channel;

a magnetic field generator located between the sensor unit and the input port;

an output channel in fluid connection with the sensor unit;

an output port in fluid connection with the output channel; and

an orifice assembly located between the magnetic field generator and the output port, wherein the orifice assembly has at least one opening and, in response to magnetic flux generated by the generator from the sensor unit to the output port, the at least one opening opens to allow fluid flow to the output port.

12. The mass flow controller of Claim 11, wherein the magnetic field generator is located approximately parallel to and at least partially overlaps the first channel.

13. The mass flow controller of Claim 11, further comprising a bypass assembly located between the sensor unit and the output port.

14. The mass flow controller of Claim 11, wherein the at least one opening is sealed when no magnetic flux is generated by the magnetic field generator.

15. The mass flow controller of Claim 11, wherein fluid flow through the sensor unit is approximately perpendicular to the flow direction of the magnetic flux.

16. The mass flow controller of Claim 11, wherein the input port and the output port are located at the same end of the mass flow controller.

17. The mass flow controller of Claim 13, further comprising a spring-biased sealing mechanism located between the bypass assembly and the orifice assembly.

18. The mass flow controller of Claim 17, wherein the sealing mechanism comprises a ferromagnetic material.

19. A method for controlling flow through a mass flow controller having a flow input, a flow output, a sensor unit, and a bypass assembly and a magnetic field generator coupled between the sensor unit and the flow input and output, the method comprising:

introducing a fluid into the flow input;

generating an electrical signal, dependent

upon a desired flow rate and a measured flow rate, to the magnetic field generator;

generating a magnetic flux, dependent on the electrical signal, traveling in a direction approximately parallel to the bypass assembly;

in response to the magnetic flux, adjusting the position of a sealing mechanism relative to an orifice to adjust the flow rate through the orifice; and

delivering the fluid out from the flow output in a direction opposite of the fluid introduction.

20. The method of Claim 19, further comprising directing a flow through the sensor unit approximately perpendicular to the flow direction through the bypass assembly.

21. The method of Claim 19, wherein the adjustment of the sealing mechanism is in a direction approximately parallel to the flow direction.

22. The method of Claim 19, wherein in the absence of the magnetic flux, the sealing mechanism seals the orifice.

23. The method of Claim 19, wherein the magnetic flux travels through the bypass assembly to pull the sealing mechanism away from the orifice.

24. The method of Claim 19, wherein the magnetic flux travels through the bypass assembly.